MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 3, 2021/2022

PMT0201 – MATHEMATICS II

(All sections / Groups)

9 AUGUST 2022
9.00 a.m. – 11.00 a.m.
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This question paper consists of **4 pages** only including the cover page with **5 questions**.
2. Attempt **ALL FIVE** questions. All questions carry equal marks and the distribution of the marks for each question is given.
3. Please write your answers in the Answer Booklet provided, and **START EACH QUESTION ON A NEW PAGE.**
4. Show proper steps.

Question 1 (10 Marks)

(a) (i) Let $P(x,y)$ be a point on the unit circle. If P is in Quadrant III, find the value of y if $x = -\frac{3}{5}$.

(ii) Suppose t is the angle formed by a traversal in a counterclockwise direction from $(1,0)$ and ending at P on the unit circle, find $\cos t$ and $\cot t$.

[3 marks]

(b) Suppose an angle α is in Quadrant III.

(i) Write $\tan\alpha$ in terms of $\cos\alpha$.

(ii) If $\cos\alpha = -\frac{3}{5}$, find the exact value of $\tan\alpha$.

[3 marks]

(c) Given that $f(x) = -3 + \cos\left(\frac{x}{3} + \frac{\pi}{3}\right)$.

(i) Determine the amplitude, period, phase shift and vertical shift of $f(x)$.

(ii) Graph one complete period of $g(x) = \cos\left(\frac{x}{3}\right)$.

(iii) On the same axes, sketch one complete period of the function $f(x)$. Indicate clearly the y intercept of $f(x)$.

[4 marks]

Continued...

Question 2 (10 Marks)

(a) Without calculators find the exact value of

$$\cos^{-1}\left(\frac{1}{2}\right) \text{ and } \cos^{-1}\left(-\frac{1}{2}\right)$$

[2 marks]

(b) Without calculators find the exact value of

$$\tan^{-1}\left(\tan\frac{2\pi}{3}\right)$$ **[2 marks]**

(c) Show that $\tan\left(\theta+\frac{\pi}{2}\right) = -\cot\theta$. **[2 marks]**

(d) Find all the solutions for x on the interval $[0,2\pi)$ if $\cos 5x - \cos 3x = 0$

Hint: $\cos(A+B) - \cos(A-B) = 2\sin(A)\sin(B)$

[4 marks]

Question 3 (10 Marks)

(a) Suppose $z = -\sqrt{3} - i$.

(i) Find the polar form of z.

(ii) Use De Moivre's Theorem to find z^{10}. Leave the answer in the form of $a + ib$ where $a,\ b \in \Re$.

[4 marks]

(b) Find the limits. Show at least one intermediate step.

(i) $\lim_{x\to 1}\sqrt{2x-1}$ **[1 mark]**

(ii) $\lim_{x\to 5}\frac{x^2-5x}{x-5}$ **[2 marks]**

(ii) $\lim_{x\to 0}\left[\frac{\sqrt{x^2+49}-7}{x^2}\right]$ **[3 marks]**

Continued...

Question 4 (10 Marks)

(a) Consider the function

$$f(x) = \begin{cases} x & x > 0 \\ -x, & x \leq 0 \end{cases}$$

Using the formal definition of the derivative, determine whether f is differentiable at $x = 0$. Show your working steps. **[3 marks]**

(b) Find

$$\frac{dy}{dx} \quad \text{if} \quad y = x\ln(1 + 5x)$$

Show proper steps and simplify your answer. **[4 marks]**

(c) Given the displacement of a particle, $s(t) = t^3 - 5t^2 + 10$. Find the velocity $v(t)$ and acceleration $a(t)$ of the particle when $t = 2$. **[3 marks]**

Question 5 (10 Marks)

(a) Solve the indefinite integral:

$$\int \sqrt{1 + \cos 4x}\, dx$$

Hint: Note that $1 + \cos 2\theta = 2\cos^2\theta$; Let $\theta = 2x$

[3 marks]

(b) Solve the definite integral:

$$\int_1^9 \frac{2x^2 - 1}{x^2} dx$$

Hint: Simplify the equation by and integrate term by term.

[3 marks]

(c) Find the area bounded by the curve $y = x^2 + x + 4$, the x-axis and the lines, $x = 1$ and $x = 3$. Sketch a diagram and show all your working. **[4 marks]**

End of Page.